CDM

Contaminant Screening Study
Libby Asbestos Site, Operable Unit 4
Libby, Montana

Draft Sampling and Analysis Plan Addendum
Post Clean-Up Evaluation Sampling

November 2003

Sampling and Analysis Plan Addendum

Response Action Contract
for Remedial, Enforcement Oversight, and Non-Time
Critical Removal Activities at Sites of Release or
Threatened Release of Hazardous Substances
in EPA Region VIII

U.S. EPA Contract No. 68-W5-0022

Draft Sampling and Analysis Plan Addendum, Post Clean-Up Evaluation Sampling, Contaminant Screening Study, Libby Asbestos Site, Operable Unit 4

November 13, 2003

Work Assignment No.: 137-RIRI-08BC
Document Control No.: 3282-137-PP-SAMP-19059

Prepared for:
U.S. Environmental Protection Agency
Region VIII
999 18th Street, Suite 500
Denver, Colorado 80202

Prepared by:
CDM
1331 17th Street, Suite 1100
Denver, Colorado 80202

and
Syracuse Research Corporation
999 18th Street, Suite 1975
Denver, Colorado 80202

Response Action Contract for Remedial, Enforcement Oversight, and Non-Time Critical Removal Activities at Sites of Release or Threatened Release of Hazardous Substances in EPA Region VIII

U.S. EPA Contract No. 68-W5-0022

Draft Sampling and Analysis Plan Addendum, Post Clean-Up Sampling, Contaminant Screening Study, Libby Asbestos Site, Operable Unit 4

Work Assignment No.: 137-RIRI-08BC

Reviewed by: _____ Date: 11/13/03
Dave Schroeder
CDM Project Scientist

Reviewed by: Laura Splichal Date: 11/13/03
for George DeLullo
RAC VIII QA Manager

Approved by: _____ Date: _____
Jim Christiansen
EPA Region VIII Remedial Project Manager

CDM

Contents

Tables

Acronyms

AHERA	Asbestos Hazard Emergency Response Act
CDM	CDM Federal Programs Corporation
CE	post clean-up evaluation
DQO	data quality objective
EPA	Environmental Protection Agency
FSDS	field sample data sheet
HEPA	high efficiency particulate air filter
ISO	International Organization of Standardization
LA	Libby amphibole
MCE	mixed cellulose ester
mm	millimeter
PIF	pre-sampling interview form
QAPP	quality assurance project plan
RI	remedial investigation
S/cc	structures per cubic centimeter
S/cm^2	structures per square centimeter
SAP	sampling and analysis plan
SOP	standard operating procedure
SRC	Syracuse Research Corporation
TEM	transmission electron microscopy

Section 1
Introduction

This addendum outlines the site-specific requirements to collect data that will evaluate the long term efficacy of residential clean-up actions conducted as part of the Libby Asbestos Project. All quality assurance procedures and standard operating procedures (SOPs) from the remedial investigation (RI) sampling and analysis plan (SAP) will apply (CDM Federal Programs Corporation [CDM] 2003).

1.1 Background

Because of the potential threats posed to public health by contamination resulting from vermiculite mined in Libby, the Environmental Protection Agency (EPA) is currently taking a number of clean-up actions intended to reduce the potential for Libby amphibole (LA) asbestos releases from primary and secondary sources, including:

- Removal of indoor vermiculite containing insulation at locations where the insulation is subject to disturbance.
- Removal of outdoor soils that contain LA asbestos at concentrations higher than 1 percent by mass.
- Removal of indoor dust at locations where LA asbestos loading is equal to or greater than 5,000 Asbestos Hazard Emergency Response Act (AHERA) structures per square centimeter (S/cm^2).

In addition, EPA is providing high efficiency particulate air filter (HEPA) vacuum cleaners to residents after the removal is completed to help reduce concentrations of LA asbestos in indoor dust at their properties.

At present, clean-ups have taken place at more than 140 properties. Following each clean-up, confirmation sampling occurs by collecting samples of indoor air after vigorous disturbance with a leaf-blower, and a property is not declared to be acceptable unless the site-specific clearance rule for a living space (each of approximately 5 samples of disturbed air on the level(s) or floor(s) cleaned are below the detection limit of the AHERA transmission electron microscopy [TEM] method [AHERA 2002]) is satisfied. Thus, the short-term efficacy of the actions is well-established. However, a number of important questions remain regarding the longer-term efficacy and permanence of the clean-up.

1.2 Objective

The objective of the sampling program detailed in this SAP is to obtain data that will

- Determine the magnitude of the reduction in exposure level due to the clean-up.

- Determine the residual exposure levels of residents in homes after clean-ups have been completed.

- Determine if residual sources such as dust inside air ducts and furnaces or in carpets and upholstery cause re-contamination of indoor dust in a home, and if so, is that of concern

Section 2
Data Quality Objectives

The data quality objective (DQO) process is a series of seven planning steps based on the scientific method that are designed to ensure that the type, quantity, and quality of environmental data used in decision-making are appropriate for the intended purpose. The goal of the DQO process is to help assure that data of sufficient quality are obtained to support remedial response decisions. Application of this seven step procedure to this investigation is presented below.

Step 1. State the Problem

The problem is that only limited data are available to quantify the longer-term efficacy and permanence of clean-ups in homes in Libby.

Step 2. Identify the Decision

The decision to be made is whether or not the current strategy of clean-up in residential areas of Libby is effective and permanent, or whether any revisions or refinements in clean-up strategy are needed.

Step 3. Identify Inputs to the Decision

The basic data needed to address the issues of concern and the decisions to be made are accurate and reliable measures of LA asbestos concentrations in indoor media in residences in Libby that have undergone clean-up. In particular, in order to provide data on the level of residual risk that remains at residences that have undergone clean-up, data are needed on indoor air concentrations under routine living conditions. This includes measures of both ambient air (as measured using stationary samplers) and personal air (measured using person air monitors worn by residents engaged in normal activities). In addition, measures of LA asbestos loading in dust are needed to determine whether re-contamination of indoor dust from residual indoor sources is of concern, and also to allow for comparison of pre-and post-clean-up LA asbestos loading values.

Step 4. Define the Study Boundaries

Spatial Bounds

The scope of the study will be restricted to residences in Libby that have undergone one or more types of clean-up, including a) removal of exposed vermiculite insulation, b) removal of indoor dust by EPA, c) removal of indoor dust by the resident using an EPA-provided HEPA vacuum, and d) removal of outdoor soil contamination. Not all residences that have undergone clean-up will be assessed, but

rather a selected sub-set of approximately 30 homes. The homes selected will represent a mixture of different conditions, as detailed in Section 3.

Temporal Bounds

Because health risks from LA asbestos are related mainly to long-term average exposure levels, this study will include measures of contamination in air and dust not only at times shortly after clean-up, but also measures at a series of times after clean-up. This repeated measurement at selected locations over time will help better characterize long-term average exposure levels, and will also allow for an assessment of whether there is a time trend either for continued decreases in exposure (as hoped), or continued increases in exposure (from potential sources of re-contamination). Details on sampling schedule are presented in Section 3.

Step 5. Develop a Decision Rule

As noted above, the basic decisions to be made from the data collected during this investigation are whether the residual risk that remains after clean-up of a residence are within acceptable bounds, and whether there are any significant time trends in exposure (either decreasing or increasing). The basic decision rules are as follows:

1. If the residual risks at most residences that have undergone clean-up are not below a level of concern, it will be concluded that, to the extent practical, the clean-up strategy requires modification to increase the level of protectiveness.

2. If the residual risks at most residences that have undergone clean-up are below a level of concern, and if there is no substantial time trend toward re-contamination, it will be concluded that the current strategy is effective and no revisions in strategy will be required.

3. If the residual risks at most residences that have undergone clean-up are below a level of concern, but there is a substantial time trend toward re-contamination, and the level of re-contamination may reach or exceed a level of concern, it will be concluded that, to the extent practical, more effort will be required to identify and reduce LA asbestos levels in residual secondary sources (e.g., dust in air ducts, carpets, upholstery, etc.)

Step 6. Specify Limits on Decision Errors

As discussed in the Action Level and Clearance Criteria Technical Memorandum (EPA 2003), there is uncertainty in the concentration of LA asbestos in air and in dust that is of significant human health concern in residences in Libby. This uncertainty arises mainly from two sources: 1) lack of knowledge as to how health risks depend upon the size distribution of inhaled fibers, and 2) lack of knowledge regarding the relationship between the concentration of LA asbestos in source materials and in inhaled air. Because of these uncertainties (which are outside the scope of this investigation), it is not possible or necessary to define rigorous statistical limits on

decision errors associated with this study. Nevertheless, it is desirable to minimize uncertainty and decision errors that are related purely to analytical measurement error. For this reason, the analytical sensitivity of measurements on LA asbestos in air and dust must be adequate to quantify occurrence levels and detect the effect of clean-up with confidence.

Table 2-1 summarizes the sensitivity levels in air and dust that are required to reliably detect (power = 80%, alpha = 0.05) the difference between a range of different starting and ending Libby amphibole (LA) asbestos levels in air and dust. For air, if it is assumed that the pre-clean-up concentrations were on the order of 0.005 structures per cubic centimeter (S/cc), and if the post-clean-up concentrations were expected to be 0.001 S/cc or less, then a sensitivity of 0.005 S/cc is needed to be able to recognize and quantify this difference with reliability. Likewise, for dust, if the starting loading level were on the order of 5,000 S/cm^2 and the expected effect of clean-up were at least a 5-fold reduction, then a sensitivity of about 500 S/cm^2 is required to detect and quantify this difference. Thus, these sensitivity values should be viewed as minimum target levels, and even lower sensitivities are desirable if feasible.

Table 2-1 Target Sensitivity Levels in Air and Dust

Required Sensitivity for Air (S/cc) (Alpha = 0.05)			
Magnitude of Reduction	Starting Concentration (S/cc)		
	0.500	0.050	0.005
2-fold	0.0137	0.0014	0.0001
5-fold	0.0513	0.0051	0.0005
10-fold	0.0804	0.0080	0.0008
Required Sensitivity for Dust (S/cm^2) (Alpha = 0.05)			
Magnitude of Reduction	Starting Concentration (S/cm^2)		
	5000	2000	500
2-fold	137	55	14
5-fold	513	205	51
10-fold	804	321	80

S/cc = structures per cubic centimeter
S/cm^2 = structures per square centimeter

Step 7. Optimize the Design for Obtaining Results

As results are obtained during this study, the preliminary data will be used to make refinements in sampling and analytical strategy, as needed.

Section 3
Sampling Program

This section describes the sampling program for the post clean-up evaluation:

- Selection of homes to be sampled
- Sampling methods (pre-interview and meeting, ambient air sampling, personal air sampling, and dust sampling)
- Quality control requirements
- Sample labeling and identification

All details regarding field documentation, sample custody and documentation, chain-of-custody requirements, sample packaging and shipping, field paperwork distribution, and equipment decontamination are detailed in the Final RI SAP (CDM 2003).

By the end of January 2004 post clean-up evaluation sampling is planned to occur at 30 properties. After evaluation of the initial results, additional sampling will be completed at selected properties in four-month intervals (May 2004, September 2004, and January 2005).

3.1 Selection of Homes to be Sampled

Selection of homes to be sampled will be based on the following criteria:

- Interior cleaning must have occurred - this could be a vermiculite insulation removal, an interior cleaning due to elevated dust results, or both.
- Home that use forced air heating are preferred. As there are a limited number of homes in the area that use forced air heating, homes that use radiant heating may be sampled.
- Homes where vermiculite was left in place (i.e., walls, crawl spaces, sub-floors).
- Properties that were cleaned up early in the project and more recently.
- Properties where an interior cleaning was conducted due to high dust results, and the carpeting was cleaned but not removed.
- Properties that in addition to an interior clean-up had significant exterior contamination removed.

The above listed criteria will be used to select properties to be sampled as part of the post clean-up evaluation sampling detailed in this SAP. In addition, all properties will be issued a HEPA vacuum prior to the post clean-up evaluation sampling with instruction to use the vacuum as part of the regular household vacuuming.

Once a list of prospective properties has been generated, the resident and/or owner of each property will be contacted about their willingness to participate in the post clean-up evaluation.

3.2 Sampling Methods

The post clean-up evaluation will involve the following steps:

- Pre-sampling meeting with each homeowner
- Ambient air sampling
- Personal air sampling
- Dust sampling

3.2.1 Pre-Sampling Meeting

Prior to the collection of samples, a pre-sampling meeting will be conducted with each resident. The purpose of the meeting is to interview the occupants of each home to capture information regarding any activities the residents may be involved in or properties routinely visited by the occupants that could reintroduce LA contamination into their home. The interview will be documented on a pre-sampling interview form (PIF) (Attachment 1). The PIF will also capture information regarding the use of EPA provided HEPA vacuums.

The pre-sampling meeting will also be conducted to provide residents information about how to interact with the sampling equipment and who to contact if there is any issue with the equipment. The pre-sampling meeting will also provide the occupants where personal air samples are being collected with instructions on how to complete the residential activity log (Attachment 2).

3.2.2 Ambient Air Sampling

Ambient air sampling will initially be conducted at 30 homes under normal living conditions in accordance with the Sampling and Quality Assurance Project Plan (QAPP) Revision 1 for Libby, Montana, Environmental Monitoring for asbestos, Baseline Monitoring for Source Area and Residential Exposure to Tremolite-Actinolite Asbestos Fibers (EPA 2000), also known as the Phase 1 QAPP.

One ambient air sample will be collected per floor of the living space using high volume air pumps. More samples may be added depending on the square footage of

each floor. The sample will be collected in a centrally located area to avoid interference from outside air. To achieve the desired analytical sensitivity, a total air volume between 6,000 and 8,000 liters will be pulled through each 25-millimeter (mm), 0.8-micron, mixed cellulose ester (MCE) sampling filter at a flow rate that will capture this volume in one 10 to 12 hour period.

Every two to three hours each sampling filter will be checked for loading and the flow rate measured. If the loading is too high based on discoloration of the filter, the sample cassette will be replaced and sample collection will continue on a second cassette under a different sample identification number. Both cassettes will be submitted for analysis.

A stationary air field sample data sheet (FSDS) will be completed for each sample as described in the Phase 1 QAPP (EPA 2000).

3.2.3 Personal Air Sampling

Personal air sampling will be conducted at 5 homes under normal living conditions in accordance with the Phase 1 QAPP.

One sample will be collected at each of 5 properties using low volume personal air sampling pumps. To achieve the desired analytical sensitivity, a total air volume between 6,000 and 8,000 liters will be pulled through a single 25-mm 0.8-micron, MCE sampling filter at a flow rate that will capture this volume in three 8 to 10 hour periods (3 days).

In addition, one ambient air sample will be collected per floor of the living space over the same 3-day period. The flow rate for the ambient air samples will be equal to or slightly greater than the flow rate established for the personal air sampling pumps. This will provide approximately the same volume of air for each ambient sample as collected for each personal air sample.

Every two to three hours each sampling filter will be checked for loading and the flow rate measured. If the loading is too high based on discoloration of the filter, the sample cassette will be replaced and sample collection will continue on a second cassette under a different sample identification number. Both cassettes will be submitted for analysis.

During the collection of personal air samples, the resident will complete a residential activity log (Attachment 2) that will generally describe the activities they conducted while wearing the sampling pump. During the pre-sampling meeting with the resident, they will be instructed that during the time of sample collection they should turn off the pump if they leave their property. If the occupant wearing the pump exits the home but remains outdoors on their property, the sampling pump will remain on to include this period of time.

A personal air FSDS will be completed for each sample as described in the Phase 1 QAPP (EPA 2000).

3.2.4 Dust Sampling

Dust sampling will be conducted in accordance with the SAP for Indoor Dust, Revision 0, Version 2 (CDM and Syracuse Research Corporation [SRC] 2003), also known as the dust SAP, with the following exceptions:

- One dust sample will be collected per house
- Each dust sample will be at minimum a 400 cm^2 composite that spans all floors (i.e., basement, ground, second, etc.)
- For multiple floor homes one 100 cm^2 high traffic area and one 100 cm^2 horizontal surface will be collected from each floor on a single dust cassette
- For single floor homes two 100 cm^2 high traffic areas and two 100 cm^2 horizontal surfaces will be collected on a single dust cassette
- No dust blanks will be submitted

A dust FSDS will be completed for each sample as described in the dust SAP (CDM and SRC 2003).

3.3 Quality Control Requirements

Quality control requirements detailed in Section B5 of the Phase 1 QAPP (EPA 2000) will be followed for air samples collected during this sampling. These requirements include the collection of replicates and blanks for air samples only.

Replicate air samples are separate samples that are collected using separate air pumps and filters. These air samples are collected side-by-side at a location and are sampled over the same time period. Air pumps are set at the same air flow rates so that adequate and like air volumes are passed through each filter (EPA 2000). Replicate air samples will be collected at a rate of 1 per 20 samples.

Blanks are prepared by labeling an unused sample cassette and submitting them for analysis (EPA 2000). Blanks will be submitted at a rate of 1 per 20.

3.4 Sample Labeling and Identification

All samples will be labeled with index identification numbers supplied by the Volpe Center. These numbers will be maintained by the sample coordinator and signed out by the sampling teams. Sample index identification numbers will identify the samples collected during the post clean-up evaluation (CE) sampling by having the following format:

CE-#####

Where:

CE = post clean-up evaluation

= A sequential five digit number

Section 4
Laboratory Analysis and Requirements

The laboratories used for all sample analysis will have participated in, and acceptably analyzed, the required parameters in the last two proficiency examinations from both the National Institute of Standards and Technology/National Voluntary Laboratory Accreditation Program. In addition, the laboratory must participate in the laboratory-training program developed by the Libby laboratory team.

4.1 Analytical Methods

All air and dust samples collected as part to the post evaluation clean-up will be analyzed by TEM according to International Organization of Standardization (ISO) Method 10312 (ISO 1995).

4.2 Sensitivity Limits

The minimum detection limit required for air samples collected as part of the post clean-up evaluation is 0.0001 S/cc. This detection limit requirement will be specified on all chain-of-custody forms with air samples collected as part of the post clean-up evaluation.

The minimum detection limit required for dust samples collected as part of the post clean-up evaluation is 500 S/cm^2. This detection limit requirement will be specified on all chain-of-custody forms with dust samples collected as part of the post clean-up evaluation.

Section 5
References

AHERA. 2002. Asbestos Hazard Emergency Response Act 40 CFR, Chapter 1, Subchapter R, Part 763, Subpart E, Appendix A. Federal Register 2 FR 41846, October, 1987. Data current as of the Federal Register dated May 2002.

CDM. 2003. Final Sampling and Analysis Plan, Remedial Investigation, Contaminant Screening Study, Revision 1. May

_____ and SRC. 2003. Sampling and Analysis Plan for Indoor Dust, for use at the Libby, Montana, Superfund Site, Revision 0, Version 2. August.

EPA. 2000. Sampling and Quality Assurance Project Plan Revision 1 for Libby, Montana, Environmental Monitoring for Libby amphibole (LA) asbestos, Baseline Monitoring for Source Area and Residential Exposure to Tremolite-Actionlie Libby amphibole (LA) asbestos Fibers. January.

_____. 2003. Libby Asbestos Site, Residential/Commercial Clean-up, Action Level and Clearance Criteria Technical Memorandum. In preparation.

International Organization for Standardization (ISO). 1995. Ambient Air – Determination of Asbestos Fibers – Direct transfer Transmission Electron Microscopy Method. ISO 10312:1995(E).

Attachment 1

Pre-Sampling Interview Form (PIF)

BD#_____

LIBBY ASBESTOS PROJECT
Pre-Sampling Interview Form (PIF) for
Post Clean-up Evaluation Sampling

Field Logbook No.:_____ Page No.:_____ Site Visit Date: _____

Address:_____ Structure Description:_____

Occupant:_____ Phone Number:_____

Owner (if different than occupant):_____ Phone Number:_____

Business Name:_____

Sampling Team:_____

Field Form Check Completed by (100% of forms):_____

Data Item	Value	Notes
CLEAN-UP SUMMARY (To be completed using removal completion folders)	**Date Removal Completed:** _____	
Location of vermiculite removed indoors	Attic Walls (interior or exterior) Crawl Space Basement Sub-floor Other:_____	
Location of vermiculite remaining indoors	Attic Walls (interior or exterior) Crawl Space Basement Sub-floor None Other:_____	
Interior cleaning conducted during removal	Yes No If Yes, which floors: Ground First Second Garage Other:_____	
Was carpet removed during removal activities?	Yes No NA	
Location of vermiculite removed outdoors	Driveway Flowerbed Garden Stockpile Yard None Other:_____	
Location of vermiculite remaining outdoors	Driveway Flowerbed Garden Stockpile Yard None Other:_____	

Data Item	Value	Notes
Pre-Sampling Interview (To be completed with resident)		
Has EPA provided a HEPA vacuum and has it been used since removal?	Yes No If Yes, how long after removal was completed did used of EPA issued HEPA vac begin: Immediately 1 to 2 months 3 to 4 months 5 to 6 months more than 6 months	
How often do you vacuum with your EPA provided HEPA vacuum?	Once a week More than once a week Twice a month Once a month Less than once a month Other:_____	
Heating Source	Wood/Coal Electric Propane/Gas Other:_____	
Heat Distribution	Forced air Radiant Other:_____	
How soon after the removal was a forced air heating source first used?	Immediately 1 to 2 months 3 to 4 months 5 to 6 months more than 6 months	
Have any of the occupants been in contact with any vermiculite since the removal was completed?	Yes No Unknown	Explain:
Addresses of other homes or properties where the occupants visit and may contain vermiculite		To be completed by field personnel: Do these properties currently have indoor or outdoor vermiculite?
Addresses or names of business where occupants work		To be completed by field personnel: Do these properties currently have indoor or outdoor vermiculite?

ADDITIONAL INFORMATION_____

_____

_____

Attachment 2

Residential Activity Log

Residential Activity Log

Resident Address: _____

Volunteer Name: _____

Sampling Date(s): _____

Personal air sample number (s): _____

FSDS number(s): _____

Date/Time Interval	Go Outside?	Pump problem?	General Activities
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	
	No Yes (___ mins) Describe	No Yes (describe)	

Note: Continue on second page if necessary.